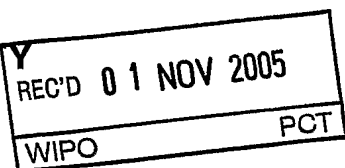


# PATENT COOPERATION TREATY

## PCT



### INTERNATIONAL PRELIMINARY EXAMINATION REPORT (PCT Article 36 and Rule 70)



Applicant's or agent's file reference WO 39135	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. PCT/EP2003/014013	International filing date (day/month/year) 10.12.2003	Priority date (day/month/year) 10.12.2003
International Patent Classification (IPC) or both national classification and IPC F01D17/14		
Applicant HONEYWELL INTERNATIONAL INC.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 7 sheets, including this cover sheet.  
  
☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).  
  
 These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:
  - I ☒ Basis of the opinion
  - II ☐ Priority
  - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
  - IV ☐ Lack of unity of invention
  - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
  - VI ☐ Certain documents cited
  - VII ☐ Certain defects in the international application
  - VIII ☐ Certain observations on the international application

Date of submission of the demand  30.05.2005	Date of completion of this report  31.10.2005
Name and mailing address of the international preliminary examining authority:   European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer  Koch, R  Telephone No. +49 89 2399-7234 

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/EP2003/014013

**I. Basis of the report**

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*):

**Description, Pages**

1-15 as originally filed

**Claims, Numbers**

1-10 received on 19.10.2005 with letter of 19.10.2005

**Drawings, Sheets**

1/10-10/10 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).  
☐ the language of publication of the international application (under Rule 48.3(b)).  
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.  
☐ filed together with the international application in computer readable form.  
☐ furnished subsequently to this Authority in written form.  
☐ furnished subsequently to this Authority in computer readable form.  
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.  
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:  
☐ the claims, Nos.: 11,12  
☐ the drawings, sheets:

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/EP2003/014013

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Yes: Claims	6,7,10
	No: Claims	1-5,8,9
Inventive step (IS)	Yes: Claims	
	No: Claims	1-10
Industrial applicability (IA)	Yes: Claims	1-10
	No: Claims	

2. Citations and explanations

**see separate sheet**

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP2003/014013

Reference is made to the following documents:

- D1: EP-A-0 342 889 (HOLSET ENGINEERING CO) 23 November 1989
- D2: EP-A-1 260 675 (IVECO MOTORENFORSCHUNG AG) 27 November 2002
- D3: GB 874 085 A (GARRETT CORP) 2 August 1961
- D4: DE 10 34 192 B (BERNARD COLLIGNON;SNCF) 17 July 1958
- D5: US-A-4 056 330 (LIEBER JEAN) 1 November 1977
- D6: DE 102 10 369 A (DAIMLER CHRYSLER AG) 25 September 2003
- D7: DE 199 24 228 A (3K WARNER TURBOSYST. GMBH) 7 December 2000
- D8: US-A-4 586 336 (HOERLER HANSULRICH) 6 May 1986
- D9: US-A-6 158 956 (ARNOLD STEVEN DON) 12 December 2000
- D10: US-B1-6 216 459 (DAUDEL HELMUT ET AL) 17 April 2001
- D11: DE 198 35 594 A (AUDI NSU AUTO UNION AG) 10 February 2000
- D12: WO 2004/035994 A (HETTINGER; LOMBARD; LAVEZ) 29 April 2004

1. The application does not meet the requirements of Article 6 PCT for the following reasons:

- independent apparatus claims 1 and 9 lack conciseness
- independent claim 9 does not contain the same essential features as claim 1 thereby also conflicting with Rule 13.1 PCT
- the characterising portion of independent apparatus claim 9 is characterised by methodical features/steps
- independent method claim 8 is not restricted by the apparatus features "with turbochargers according to claim 6", hence does not contain all required essential features, see also point 5.
- independent claim 9 does not define in the characterising portion which engine ("an engine") is meant and how "the engine boosting system opens said annular nozzle" (Article 5 PCT)
- the characterising portion of claim 1 does not contain the same consistent feature formulation as its preamble: "into the radial inside or onto the radial outside"
- claims 1 to 4 refer to different subject-matter "nozzle device" and "variable nozzle device"
- claim 10 is not correctly made dependent on claim 6 or 9

**Re Item V**

2. Furthermore, the present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of independent **claims 1, 8 and 9** is not new in the sense of Article 33(2) PCT.

2.1 Document D1 (and also documents D2-D4) discloses in Fig. 1-8 all the features of the variable nozzle device of **claim 1**, wherein the D1 outboard wall 15 is constituted by the axially slidable tube-shaped piston 4 which comprises at its distal end a stepped portion (Fig. 7) which contacts the inboard wall 5 for completely closing the variable nozzle device.

The feature "stepped portion" thereby has a clear but broad meaning and can widely be interpreted, inter alia such that the discontinuous outboard wall 15 of D1, blanked out by the openings for the vanes 6, can be considered as being stepped.

Document D2 discloses in Fig. 1-9 an axially slidable, vaned ring (piston) 13 that closes the radial flow channel on the radial inside as well as outside of the second vaned ring (inboard wall) 12. The tube-shaped ring 13 comprises a stepped saw-tooth profile at its distal end (see Fig. 1).

Document D3 discloses in a similar manner as D2 a stepped saw-tooth, respectively rib-slot profile also directing exhaust flow therethrough on the nozzle inside and outside (see Fig. 3).

Document D4 discloses piston bodies 12 and 13 that slide over the inside and outside of the blades/vanes 2 and 1. The distal end piston portions 8 and 7 have intermittent outer surfaces (cut-outs) from their radial outer corner (20) to their inner corner (19).

As regards the feature "stepped portion" in documents D1 and D4, it has to be noted that in any case this feature, however interpreted, does not render claim 1 inventive (Article 33(3) PCT) over a D1/D4 combination with the stepped nozzle devices of e.g. documents D5, D7, D8 (Fig. 5) or D9, since the same technical effects (fully opened, bypassing of vanes, fully closed) are achieved therewith.

As regards the feature "annular arrangement of vanes" it is obvious that all above mentioned documents D1 (Fig. 8), D2 (paragraph 0011), D3 (Fig. 3) and D4 (Fig. 1) (as well as D5, D8, D9, D11 and D12) contain such an arrangement. This feature, however, does not define where the vanes are fixed to.

**2.2** Documents D7 (Fig. 3a, 3b) and D12 (Fig. 4a, 4b) both disclose an engine boosting system with a nozzle bypass opening according to **claim 9**. Although no catalysts or any other downstream consumer units are mentioned therein, both D7 and D12 systems are suitable beyond doubt for to be used in connection with such a catalyst, as e.g. shown in document D11.

**2.3** Document D11 discloses all features of the method **claim 8** (even considering the parallel configuration of engine boosting turbochargers 2a, 2b), wherein the variable nozzle device (col. 4, lines 6-15) of the second turbocharger turbine (5b) completely closes its nozzle opening when said second turbocharger is driven under low rotational speed of the engine.

Please note, that the turbocharger systems of the internal combustion engines of documents D1, D2, D4, D7-D9 and D12, which are designed for completely closing their nozzle openings under low load/speed conditions, are also suitable for to be operated in a parallel boosting configuration.

**3.** Dependent **claims 2-7** do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step (Article 33(3)), as their additional features are disclosed in documents D1-D12 and used therein for the same technical purposes:

**Claim 2:** see D1, D2, D3 or D4

**Claim 3:** see D1 (Fig. 4) or D2 (Fig. 2) or D12 (Fig. 4a).

**Claim 4:** see D2-D5 or D8 (Fig. 3) or D12.

**Claim 5:** see e.g. D1, D2, D3 or D4

**Claim 6:** see e.g. D1-D4 (suitable for) or D10, D11

**Claim 7:** see D6 (whole doc) or D7 (completely closing of nozzle outlet 8b) or D10 (whole doc) or D12 (implicitly enclosed) or documents D1, D2, D4, D9 which are all suitable "for engine braking" purposes from their technical working

principle point of view "... where there is provided a high boost pressure and a high back pressure at the same time"

4. So far, no clear, concise and novel set of independent apparatus and method claims have been filed. Furthermore, almost all cited prior art turbochargers which are equipped with a variable geometry, sliding vane technology fulfill the same technical principle, namely the control or regulation of the system pressures (boost, back) dependent on the load, flow or speed characteristic of their respective internal combustion engines and therefore can easily be applied in an engine boosting system with one or several turbochargers and be used for controlling, boosting, braking or for any other function typically known in the field of turbochargers. A sole aggregation of features as formulated in claims 1 to 4 can also not be considered as being sufficient to render the present application inventive over a combination of documents taken from e.g. D1-D4.
5. However, if it is the object of the present invention to apply the variable nozzle device of claim 1 to an engine boosting system with a catalyst for improving its purifying function at the start of the engine as expressed on page 4 of the description, the combination of features of **claims 9+10 (claims 9+1)** would appear to be new and inventive over the available prior art, provided that this object of invention can clearly be recognized in such a new claim, explicitly or implicitly.

All criteria of Articles 6 and 33(1) PCT would be met if such an engine boosting system and/or engine operating method, based on respective definite apparatus and method features according to the content of **claims 9+1**, would clearly be characterized and distinguished by the essential features representing this object of the invention; such as

- stepped portion for bypassing the turbine wheel
- at the start of the engine the annular nozzle is opened (full open position) such that the exhaust gas flow substantially bypasses the turbine wheel and quickly heats up the catalyst (or for quickly reaching the optimum catalyst purifying temperature).

Above combination of features is neither disclosed nor suggested by the available prior art nor can it be derived from for example a joint consideration of D1 or D2 with D11.

Enclosure of October 19, 2005

PCT-Application No.: PCT/EP03/014013  
Applicant: HONEYWELL INTERNATIONAL INC.  
Our ref.: WO 39135

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### **Claims 1 to 10**

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1. A nozzle device for a turbine of a turbocharger,  
10 comprising a variable annular nozzle (2) defined between an  
inboard wall (3) and an outboard wall (4), wherein  
said outboard wall (4) is axially movable for  
completely closing said variable annular nozzle (2);

15 an annular arrangement of vanes (5) is interposed in  
said variable annular nozzle (2), and

said outboard wall (4) is constituted by a tube-shaped  
piston (6, 106) which is axially slidable into the radial  
inside or onto the radial outside of said annular  
arrangement of vanes (5) so as to contact said inboard wall  
20 (3),

#### **characterised in that**

said tube-shaped piston (6; 106) comprises at its  
distal end a stepped portion (17; 117) which is axially  
slidable onto the radial outside or radial inside of said  
25 annular arrangement of vanes (5).

2. The variable nozzle device according to claim 1,

wherein said stepped portion (117) is axially slidable  
onto the radial outside of said annular arrangement of  
30 vanes (5) and directs exhaust gas entering into the turbine  
to the downstream side of the turbine.

3. The variable nozzle device according to claim 1 or 2,  
wherein said annular arrangement of vanes (5) extends only  
35 over a part of the maximum interval between said inboard  
and outboard walls (3, 4).



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4. The variable nozzle device according to any one of claims 1 to 3, wherein said inboard wall (3) is constituted by a vaned shroud (7) having said annular arrangement of  
5 vanes (5).

5. A turbocharger (8) having a turbine (1) comprising the variable nozzle device according to any one of claims 1 to  
4.

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6. An engine boosting system comprising a parallel configuration of at least a first and a second turbocharger (9, 8), wherein a turbine (1) of said second turbocharger (8) is characterized by a variable nozzle device according  
15 to any one of claims 1 to 4.

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7. Diesel engine boosting system comprising a turbocharger having a turbine (1) comprising the variable nozzle device according to any one of claims 1 to 4 and control means for  
closing the turbine annular nozzle (2) to an optimum  
position for engine braking where there is provided a high  
boost pressure and a high back pressure at the same time.

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8. A method for operating an internal combustion engine with a parallel configuration of turbochargers (9, 8) according to claim 6, wherein the variable nozzle device of the second turbocharger (8) completely closes its nozzle opening when said second turbocharger (8) is driven under  
low rotational speed of the engine.

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9. An engine boosting system comprising a turbocharger (8) and a catalyst (40) disposed downstream of said turbocharger (8), wherein the turbocharger (8) comprises an exhaust gas driven turbine (1) having a turbine wheel (13)  
35 and an annular nozzle (2),

3/3

**characterized in that**

said engine boosting system opens said annular nozzle (2) at a start of an engine such that the exhaust gas flow substantially bypasses the turbine wheel (13).

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10. The engine boosting system according to claim 11, comprising a turbocharger (8) having a turbine (1) comprising the variable nozzle device according to any one of claims 1 to 4.

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